Spark Plug Fault Recognition Based On Sensor Fusion And Classifier Combination Using Dempster–Shafer Evidence Theory

Ashkan Moosavian[a], Meghdad Khazaee[a], Gholamhassan Najafi[a], Maurice Kettner[b], Rizalman Mamat[c]

[a] Department of Mechanical Engineering of Agricultural Machinery, Tarbiat Modares University (TMU), Jalale-E-Aleahmad Highway, Tehran, Iran

[b] Department of Mechanical Engineering, Karlsruhe University of Applied Sciences, 76131 Karlsruhe, Germany

[c] Faculty of Mechanical Engineering, Universiti Malaysia Pahang, 26600 Pekan, Pahang, Malaysia

ABSTRACT

A proper intelligent approach was developed for fault diagnosis of spark plug in an IC engine based on acoustic and vibration signals using sensor fusion and classifier combination. Wavelet de-nosing technique was used for removing the signal noises. ANN and LS-SVM were employed in classification stage. D–S evidence theory was applied to increase the fault detection accuracy. The results showed that the classification accuracies of ANN were 67.46% and 65.08% based on the acoustic and vibration signals. For LS-SVM, the classification accuracies of 65.08% and 57.94% were achieved based on the acoustic and vibration signals. By employing D–S theory, the classification accuracy reached a high level of 98.56%. The results indicated that the data fusion method improved significantly the performance of the intelligent approach in spark plug fault detection. The simultaneous use of acoustic and vibration signals increased the effectiveness of diagnostic system in engine condition monitoring. Moreover, the results demonstrated that the proposed procedure had great potential in spark plug fault recognition.

KEYWORKS: Engine spark plug; Fault diagnosis; Acoustic signals; Vibration signals; Sensor fusion; Classifier combination; D–S evidence theory

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